

COSEWIC
Assessment and Status Report

on the

Branched Phacelia
Phacelia ramosissima

in Canada

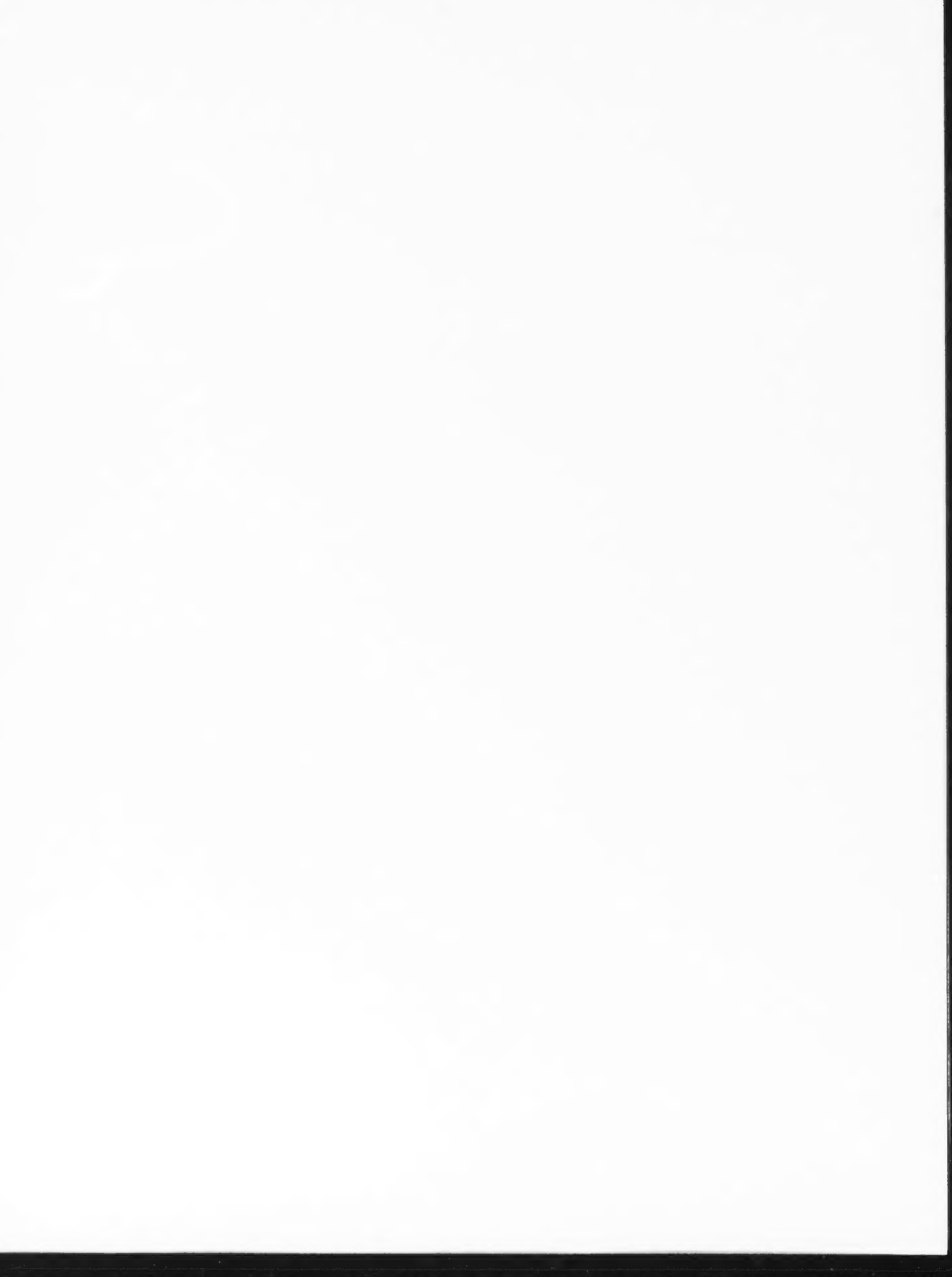


ENDANGERED
2005

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA



COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA



COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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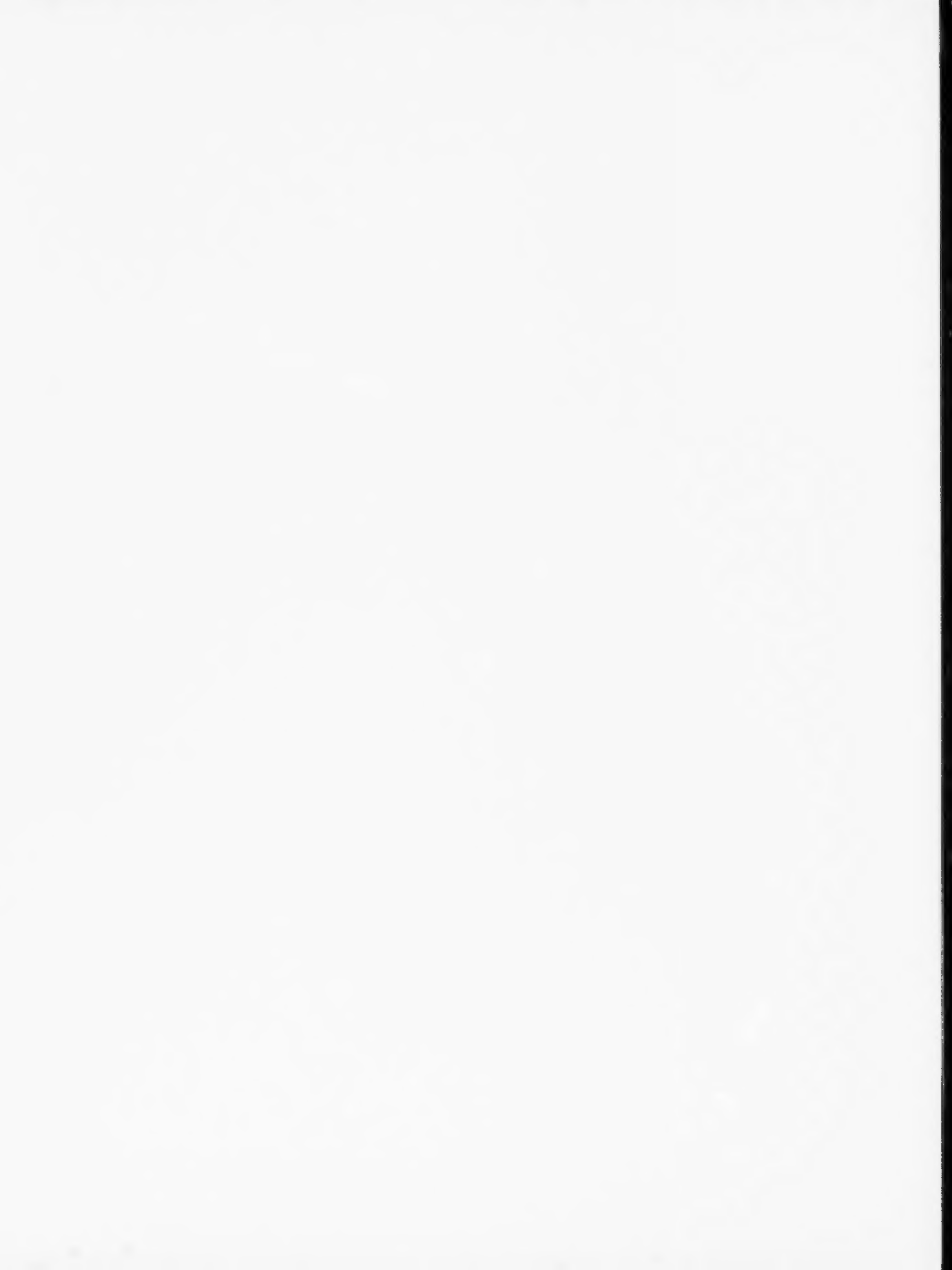
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COSEWIC
Assessment Summary

Assessment Summary – May 2005

Common name

Branched Phacelia

Scientific name

Phacelia ramosissima

Status

Endangered

Reason for designation

A geographically highly restricted perennial known only from three small populations numbering fewer than 1,000 plants subject to continued habitat loss and population decline from urban expansion and mining activities.

Occurrence

British Columbia

Status history

Designated Endangered in May 2005. Assessment based on a new status report.



COSEWIC Executive Summary

Branched Phacelia *Phacelia ramosissima*

Species information

Branched phacelia (*Phacelia ramosissima*) is a member of a genus of about 150 species, occurring mostly in western North America and Mexico. Eight of these species occur in British Columbia and 11 in Canada. Since only a single variety (var. *ramosissima*) is found in Canada the species is referred to simply as *P. ramosissima* in the report except where required for clarity to distinguish the species in Canada from variants in the United States.

Phacelia ramosissima is a prostrate to weakly ascending perennial herb from a branched stem-base and a taproot. The alternating leaves are 10-20 cm long, and 3-10 cm wide. The inflorescence is fiddlehead-shaped and consists of a cluster of lavender, pale cream, or sometimes white, corollas. The fruits are capsules that contain 8 to 12, 1-2 mm long, pitted seeds.

Distribution

Phacelia ramosissima occurs in western North America, from the southern Okanagan Valley in south-central British Columbia south through Washington and Oregon to Nevada and southern California. In British Columbia, *Phacelia ramosissima* has been collected or observed at 12 sites on the slopes of Mount Kruger, near Osoyoos, in the southern Okanagan Valley.

Habitat

Populations in British Columbia are found on the slopes of Mt. Kruger, in the Bunchgrass Biogeoclimatic Zone of southern British Columbia. This zone, particularly in the southern Okanagan Valley, has a cold, semi-arid steppe climate. The Bunchgrass Zone occupies less than one percent of the total area of British Columbia and is one of the most populated and developed areas in the B.C. interior. *P. ramosissima* is restricted, within this zone, to extremely dry talus slopes at the base of usually calcareous cliffs and rock outcrops.

Biology

There has been little research on the biology of *Phacelia ramosissima*. The species is a perennial that is well adapted to growing in areas with little precipitation. The plant is a heliotrope with its flowers turning to face the sun throughout the day.

Bees are known to be major pollinators of *Phacelia ramosissima* in California and are probably important in the southern Okanagan. Individuals of this species in British Columbia occur in close enough proximity for effective pollen transfer and the plants produce large amounts of seeds. Short-range dispersal is likely by small mammals or birds and in some cases by downslope movement of seeds. Long-range dispersal mechanisms remain unknown.

Although the habitat of this species receives little precipitation during the growing season, below-ground moisture is apparently sufficient for growth and reproduction. Highly specialized with respect to its habitat in Canada, *Phacelia ramosissima* occurs only on a narrow band of talus and rock debris below rock outcrops.

Population sizes and trends

Phacelia ramosissima has likely always been rare in British Columbia, since British Columbia is the northern extent of the species' range. The total *Phacelia ramosissima* population consists of three separate populations, all on Mount Kruger in the southern Okanagan Valley in British Columbia comprising a total of fewer than 1000 plants. The area of occupancy is between 800 and 1000 m². Two known subpopulations have been extirpated.

Limiting factors and threats

Phacelia ramosissima is limited to talus slopes in the southern Okanagan Valley in British Columbia. Significant threats to the population include mining and urban development.

Special significance of the species

Populations of *Phacelia ramosissima* in British Columbia are unique in that they are at the northern extent of their geographic range. The species has been grown in the gardens of some native plant gardeners. In southern California, Aboriginal peoples used the leaves for food and the roots for the treatment of certain medical conditions.

Existing protection or other status designations

In Canada, *Phacelia ramosissima* has a rank of N2. Provincially, it is ranked as S2 (imperiled). There is currently no specific endangered species legislation in place for the protection of vascular plants in British Columbia that have been given this critical rank. One population and one subpopulation are protected by the Provincial Park Act.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government members and the co-chairs of the species specialist and the Aboriginal Traditional Knowledge subcommittees. The Committee meets to consider status reports on candidate species.

DEFINITIONS (NOVEMBER 2004)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and it is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A wildlife species for which there is inadequate information to make a direct, or indirect, assessment of its risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994.



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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

on the

Branched Phacelia

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2005

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SPECIES INFORMATION

Name and classification

Scientific name: *Phacelia ramosissima* Douglas ex Lehm. var. *ramosissima*¹
Common name: Branched Phacelia
Family: Hydrophylaceae (Waterleaf Family)
Major plant group: Dicot flowering plant

Phacelia ramosissima var. *ramosissima* is a member of a genus of about 150 species, occurring mostly in western North America and Mexico (Hitchcock *et al.* 1959). Eight species occur in British Columbia and 11 in Canada (Scoggan 1979, Douglas *et al.* 1999a). Five additional varieties of *P. ramosissima* are generally recognized, all occurring to the south of our region (Wilken *et al.* 1993, Kartesz 1999). Since only one variety of this species occurs in Canada, the species will be referred to as *Phacelia ramosissima* in the report except where required for clarity.

Description

Phacelia ramosissima is a prostrate to weakly ascending perennial herb from a branched stem-base and a taproot (Figures 1 and 2, Douglas *et al.* 1999a). The glandular-hairy stems are 0.5-1.5 m long. The basal leaves, if any, are soon deciduous while the stalked, glandular-hairy, odoriferous stem leaves are alternate, oblanceolate in outline, 10-20 cm long, 3-10 cm wide, pinnatifid with the lobes cleft and again toothed. The inflorescence consists of a coiled, 1-sided, dense, terminal cluster of lavender, pale cream or sometimes white, 5-8 mm long, corollas. The hairy calyces have linear lobes with strongly exserted, glabrous stamens. The fruits are capsules that contain 8 to 12, 1-2 mm long, pitted seeds.

Phacelia hastata var. *hastata* may also be found in similar habitats in the southern Okanagan Valley. It is easily distinguished from *P. ramosissima* by its simple, lanceolate, sometimes basally lobed leaves.

DISTRIBUTION

Global range

Phacelia ramosissima occurs in western North America, from the southern Okanagan Valley in south-central British Columbia south through Washington and Oregon to Nevada and southern California (Figure 3, Wilken *et al.* 1993, Douglas *et al.* 1999a, Kartesz 1999). The nearest population in Washington State is about 175 km south of the Osoyoos localities in Chelan County, just south of Entiat (D. Giblin, pers. comm.)

¹Taxonomy and nomenclature follows Douglas *et al.* (1998c, d, 1999a, b, 2000, 2001).



Figure 1. Illustration of *Phacelia ramosissima*: growth habit of plant with highly enlarged flower (top) and seed (bottom right) — line drawing by Gail F. Harcombe in Douglas *et al.* 1999a, by permission.

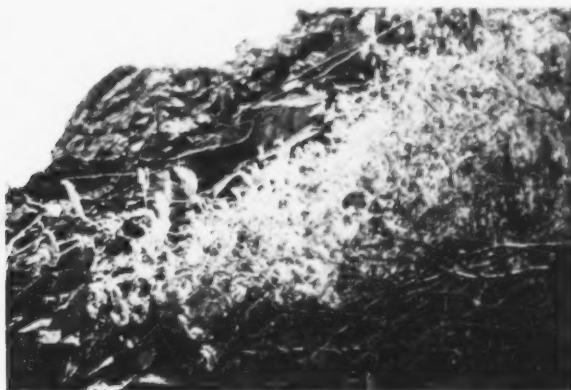


Photo by Shyanne Smith 2003

Figure 2 *Phacelia ramosissima* on talus on the east slope of Mount Kruger, south Okanagan Valley



Figure 3. Distribution of *Phacelia ramosissima* var. *ramosissima* in North America.

Canadian range

In British Columbia, *Phacelia ramosissima* has been collected or observed at 12 sites on the slopes of Mount Kruger, near Osoyoos, in the southern Okanagan Valley (Figure 4). The first collection of this species in British Columbia was recorded by H. Moore in 1986. George W. Douglas and Shyanne J. Smith searched a number of apparently suitable habitats throughout the southern Okanagan Valley and the southern Similkameen valley in 2003 and located only three new sites. One previously reported site was reconfirmed and two subpopulations were determined to have been extirpated. The search effort would appear to be sufficient since George W. Douglas has searched most (approximately 80%) of the 6100 ha of potential habitat (Figure 5) at various times over the past 12 years.

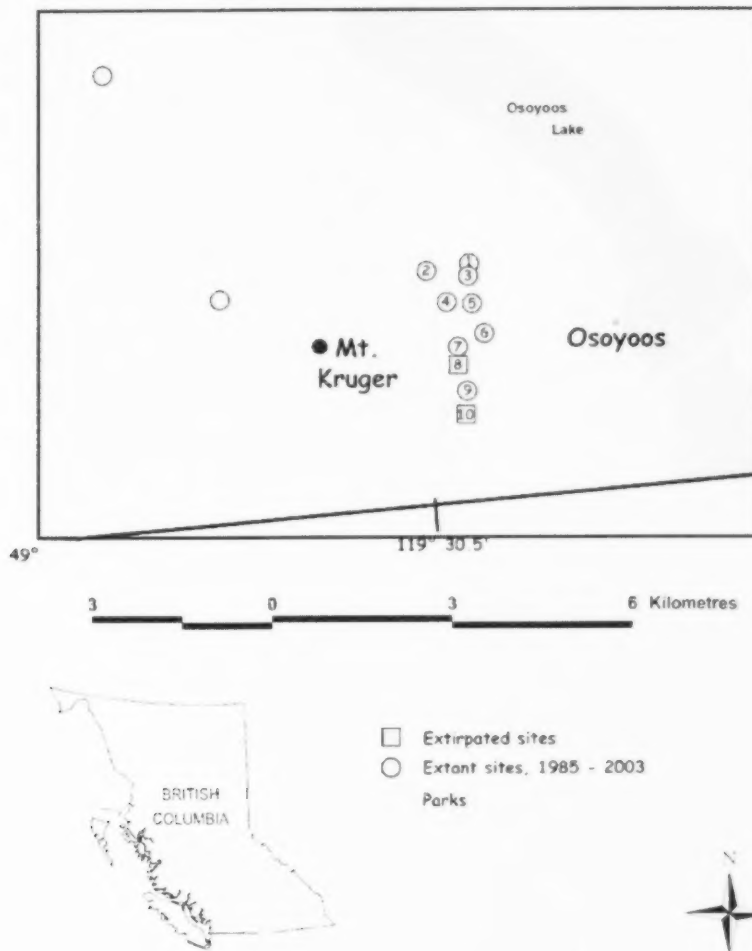


Figure 4. Canadian range of *Phacelia ramosissima*. Numbered symbols represent Mount Kruger east slope subpopulations. The west slope and north slope populations are also indicated but without numbers.

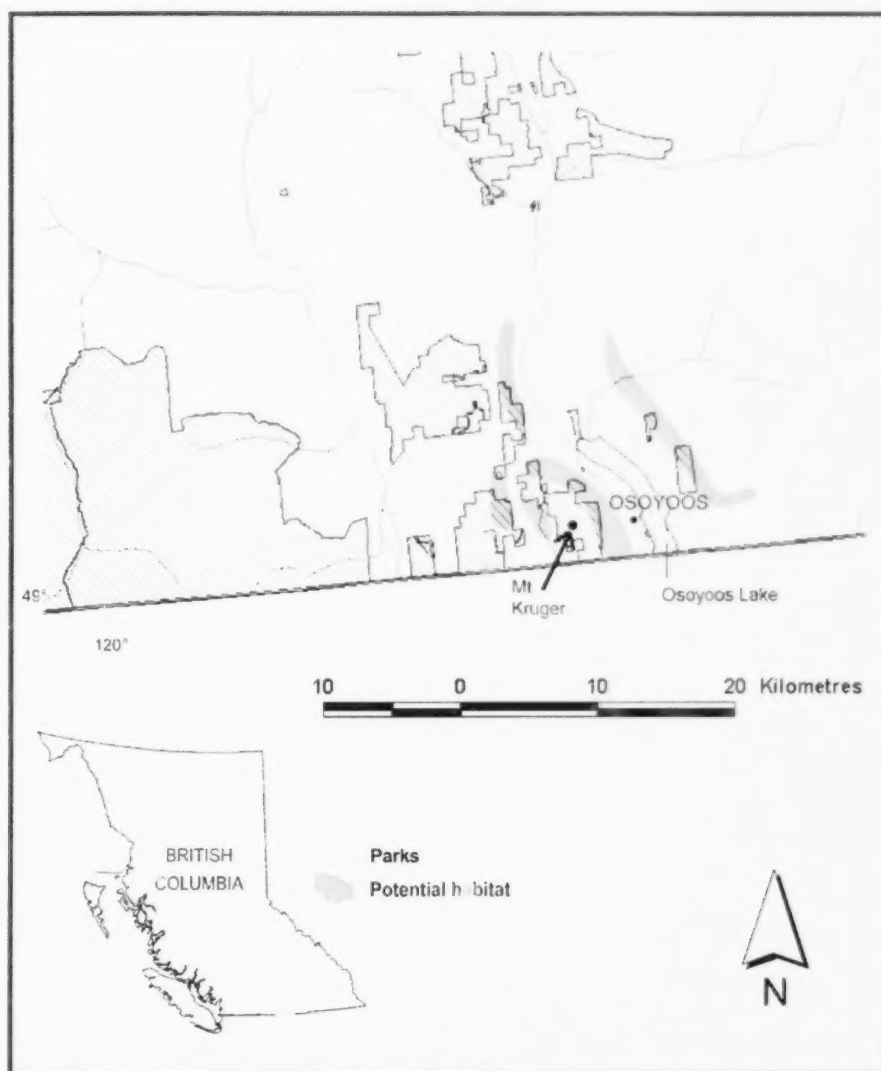


Figure 5. Potential habitat for *Phacelia ramosissima* in the southern Okanagan Valley of British Columbia. All potential habitat, except for the northwestern polygon, has been searched.

Phacelia ramosissima is just one of a number of species recently discovered (since the 1980's) along the British Columbia border from the Princeton area to the Roosville area. Some of these species include: *Antennaria flagellaris*, *Carex vallicola*, *Collomia tenellus*, *Floerkea proserpinacoides*, *Hedeoma hispida*, *Lipocarpus micrantha*, *Orobancha ludoviciana*, *Orthocarpus barbatus*, *Psilocarpus brevissimus*, *Silene*

spaldingii and *Trichostema oblongum* (Douglas *et al.* 1998a, b). Most of these species have at least one thing in common; the areas in which they were found were never subjected to botanical collecting. Examination of collection localities in all major herbaria in Canada reveal that none of the many active field botanists working along the border in British Columbia ever collected in the immediate vicinity of the recently collected plants. In the case of *P. ramosissima* in British Columbia, the dry rocky slopes on which it occurs are also the habitat of extremely high numbers of rattlesnakes. This presence of rattlesnakes and the low plant diversity of these slopes discourage most potential visitors (even keen botanists) during spring or summer.

HABITAT

Habitat requirements

Phacelia ramosissima populations in British Columbia are found in the Bunchgrass Biogeoclimatic Zone of southern British Columbia. This area, particularly in the southern Okanagan Valley, has a cold, semi-arid steppe climate. Summers are hot and dry with mean July temperatures around 20°C. Precipitation is low with mean annual rainfall of about 300 mm. Growing seasons are relatively short with mean monthly temperatures falling below freezing from December to February in the valley bottoms.

In Canada, the species is restricted to extremely dry talus slopes at the base of usually, but not always, calcareous cliffs and rock outcrops (Figure 6). These sites, at elevations of 396 to 900 m, receive little moisture after early summer thus this species reaches senescence by mid-summer. Vegetation on these sites is often sparse due to the harsh conditions. Associated species include *Achillea millefolium*, *Bromus tectorum*, *Eriogonum heracleoides* var. *angustifolium*, *Phacelia hastata* var. *hastata*, *Thelypodium laciniatum* var. *laciniatum* and *Toxicodendron radicans*. In California, where the species is more widespread and is present as several varieties, var. *ramosissima*, the variant that is also found in British Columbia, is found in diverse habitats—slopes, ridges, washes and meadows at elevations between 100 and 2800 m (Hickman 1993).

Trends

The Bunchgrass Zone occupies less than one percent of the total area of British Columbia and is one of the most populated and developed areas in the British Columbia interior (Ministry of Forests 1998). In general, trends for natural habitats in the Okanagan Valley have shown a marked decline during recent years due to various land developments. The South Okanagan is currently experiencing the fastest population increase in the province (Nature Trust 2003). According to Environment Canada (2003), the population of the Regional District of the Okanagan-Similkameen increased by 18% between 1991 and 2002, to almost 81,000 people. In addition, the town of Osoyoos has seen a population increase of over 22% between 1986 and 1996, making it the fastest growing municipality in the South Okanagan -Similkameen Regional District (Town of Osoyoos 2003).



Photos by Shyanne Smith 2003.

Figure 6. *Phacelia ramosissima* habitat on the east slopes of Mount Kruger. Mining activity (at top of left image) is within a few metres of *Phacelia ramosissima* habitat. *Phacelia ramosissima* plants occur (in the right image) at the base of this rock outcrop.

Considerable development in the Osoyoos area is currently occurring on the east slopes of Mount Kruger, above downtown Osoyoos. Natural habitat has been appropriated in favour of mineral exploration and golf course, housing and industrial development. All of these, with the exception of golf course development, have destroyed *Phacelia ramosissima* sites as well as other potential rare species habitat (Figure 7).



Photo by Shyanne Smith 2003.

Figure 7. New housing development on east slope of Mount Kruger. Mining exploration activity (reddish and whitish talus, in colour images of the site) is evident on slopes in the background. Two subpopulations, now extirpated, were at the exploration area and on a home site just to the right of the photo.

Protection/ownership

The population on the west slope of Mount Kruger, as well as one of the east slope subpopulations, is located in the South Okanagan Grasslands Protected Area. This area receives protection under the Provincial Parks Act. Three additional sub-populations are located on Crown land on the east slopes of Mount Kruger. Much of this area is covered by active mineral claims. A Wildlife Habitat Area ² is currently under consideration for part of the east slope of Mount Kruger (J. Hobbs, pers. comm.). This would provide protection for the latter three subpopulations on the east slope of the mountain. The remaining five extant subpopulations (as well as the two extirpated subpopulations) on the east slope of Mount Kruger and the north slope population are on private land (Figure 4).

BIOLOGY

General

There has been little research on *Phacelia ramosissima*. The species is a perennial that is well adapted to growing in areas with little precipitation during the growing season. It is said to be a heliotrope because of its manner of turning its flowers to face the sun throughout the day.

Reproduction

The age profile of mature *Phacelia ramosissima* plants is not known. Bees are known to be major pollinators in California and are probably important in the southern Okanagan (Edgehill Mountain, 2003). Individuals of this species in British Columbia occur in close enough proximity for effective pollen transfer. The plants produce large amounts of seeds, which are found to have good viability and high germination rates in California gardens. Seed viability, dormancy, germination and seedling ecology remain unknown for southern Okanagan habitat.

Survival

Until *Phacelia ramosissima* populations are monitored, survival factors will remain unknown.

Physiology

Although habitats of this species receive low amounts of precipitation during the growing season, below-ground moisture, which is recharged each winter, is apparently sufficient for vegetative growth and flower and seed production before senescence occurs during mid-summer. Many, but not all, populations occur below limestone rock outcrops.

²Wildlife habitat areas (WHAs) are areas managed for selected species and plant communities that have been designated under the Forest Practices Code of British Columbia as "Identified Wildlife".

Movements/dispersal

Short-range dispersal is likely by small mammals or birds and in some cases downslope movement of seeds. Long-range dispersal mechanisms remain unknown.

Nutrition and interspecific interaction

Unknown.

Behaviour/adaptability

Phacelia ramosissima is highly specialized with respect to its habitat in Canada. It occurs only on a narrow (about 1 to 2 m wide) band of talus and rock debris below rock outcrops.

POPULATION SIZES AND TRENDS

Phacelia ramosissima has likely always been rare in British Columbia, since British Columbia is the northern extent of the species' range. Its distribution is also limited to a specialized habitat. Since *P. ramosissima* was first reported in 1986, there have been no monitoring studies on the species; therefore, population trends are unknown.

The total *Phacelia ramosissima* population in British Columbia consists of three separate populations, all on Mount Kruger in the southern Okanagan Valley (Figure 4, Table 1). Two of the populations occur on the west and north slopes while the remaining population, with eight subpopulations, is found on the east slope (Figure 4). An additional two subpopulations on the east slope have been extirpated. The east slope subpopulations occur over a north-south distance of 3.5 km. The subpopulations range in size from 10 to 280 m² and contain from 6 to 200 plants. The total population's area of occupancy is between 800 and 1000 m² supporting fewer than 1000 plants. Population trends have not been monitored at any of the sites.

Table 1. Locations and population or subpopulation sizes for *Phacelia ramosissima* on the slopes of Mount Kruger, in British Columbia.

Population	Last Observation	Observer	Number of Plants/Area
North slope	1985	Moore	Unknown
West slope	1998	Miller	6 plants/10 m ²
East slope, subpopulation #8 ³	1991	Douglas	Extirpated
East slope, subpopulation #10	1991	Douglas	Extirpated
East slope, subpopulation #9	1995	Douglas	2 large patches/10 m ²
East slope, subpopulation #6	1997	Lomer	8 clumps/? m ²
East slope, subpopulation #1	1999	Douglas	40-50 plants/280 m ²
East slope, subpopulation #4	1999	Douglas	20 plants/100 m ²
East slope, subpopulation #2	2003	Douglas & Smith	29 plants/12 m ²
East slope, subpopulation #3	2003	Douglas & Smith	180 plants/180 m ²
East slope, subpopulation #5	2003	Douglas & Smith	200 plants/200 m ²
East slope, subpopulation #7	2003	Douglas & Smith	17 plants/?m ²

³East slope subpopulations and their numbers appear on the species range map for British Columbia (Figure 4).

LIMITING FACTORS AND THREATS

Phacelia ramosissima is limited to talus slopes and rock outcrops in the southern Okanagan Valley in British Columbia, and therefore has a highly restricted distribution in Canada. Significant threats to the population include mining (exploration at this time) and urban development. Both mining exploration and urban development are active threats with evidence of both activities observed in the Mount Kruger area in 2003 (Figures 6 and 7). Two known subpopulations have already been destroyed by urban development or mining activity in recent years (Figure 7). At one extant site, mineral exploration has occurred within a few metres of a *P. ramosissima* population (Figure 6).

SPECIAL SIGNIFICANCE OF THE SPECIES

Populations of *Phacelia ramosissima* in British Columbia are unique in that they are at the northern extent of their geographic range. The species is not known to have commercial value and is not generally known as a horticultural species. It has, however, been grown in the gardens of some keen native plant gardeners but is not especially desirable because of its weedy nature under cultivation. This attribute under garden conditions does not seem to apply under natural conditions, at least in British Columbia. In Canada, the species is quite restricted in its distribution and does not exemplify the general attributes of weeds that allows them to spread and occupy diverse habitats as seems to occur in states such as California.

The leaves have been used as a food source by natives of southern California and the roots for certain medical treatments (Moerman 2005).

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Phacelia ramosissima is not covered under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Endangered Species Act (USA) or the IUCN Red Data Book. Globally, *P. ramosissima* var. *ramosissima* has a rank of G4T?, indicating this variety has yet to be ranked (NatureServe 2003). It is quite likely that this taxon, since it is not tracked by any of the four U.S. States (California, Nevada, Oregon and Washington) in which it occurs, should have a T rank of at least T4.

This species is not tracked as a rare species outside of British Columbia and is ranked SR in California, Nevada, Oregon and Washington by NatureServe (2003). The SR rank is in error since that rank indicates that a species is "reported for the state, but without persuasive evidence for either accepting or rejecting the report". In fact, numerous floras treat the species, including Hitchcock *et al.* (1959) for Washington, Peck (1961) for Oregon, Kartesz (1988) for Nevada and Wilkens *et al.* (1993) for California. In California, this variety is listed as occurring in nine different geographic subdivisions indicating that it is likely at least frequent in that state (Wilkens *et al.* 1993).

The correct rank for now should be S?, indicating that it has "yet to be ranked" (NatureServe 2003). When these states have all their species ranked, *P. ramosissima* var. *ramosissima* will probably be ranked either S4 or S5.

National and provincial status

Since the species is restricted to British Columbia in Canada, it has a national rank of N2. Provincially, *Phacelia ramossissima* is ranked by the British Columbia Conservation Data Centre as S2 and appears on the British Columbia Ministry of Sustainable Resource Management red list (Douglas *et al.* 2002). The S2 rank indicates that the species is "imperiled because of rarity (typically six to 20 extant occurrences or very few remaining individuals) or because of some factor(s) making it very susceptible to extirpation or extinction".

There is currently no specific endangered species legislation in place for the protection of vascular plants in British Columbia that have been placed on the Ministry of Sustainable Resource Management red list. One population (west slope of Mount Kruger) and one subpopulation (on the east slope) are in the South Okanagan Grasslands Protected Area, thus they are protected by the Provincial Park Act. In addition, a Wildlife Habitat Area is currently under consideration for part of the east slope of Mount Kruger (J. Hobbs, pers. comm., 2004). This would provide protection for an additional four subpopulations on that side of the mountain.

TECHNICAL SUMMARY

Phacelia ramosissima

Branched phacelia

Range of Occurrence in Canada: British Columbia

phacélie rameuse

Extent and Area Information	
Extent of occurrence (EO)(km²) [area encompassed by all sites on Mt Kruger]	8-15 km ²
Specify trend in EO	Unknown
Are there extreme fluctuations in EO?	No
Area of occupancy (AO) (km²) [narrow band of habitat occupied by the populations]	<<1km ² (0.0008 – 0.001 km ²)
Specify trend in AO	Unknown
Are there extreme fluctuations in AO?	No
Number of known or inferred current locations	3
Specify trend in #	Decline
Are there extreme fluctuations in number of locations?	No
Specify trend in area, extent or quality of habitat	Decline
Population Information	
Generation time (average age of parents in the population)	Unknown
Number of mature individuals	500-700
Total population trend:	Unknown
% decline over the last/next 10 years or 3 generations	N/A
Are there extreme fluctuations in number of mature individuals?	Unknown
Is the total population severely fragmented?	No
Specify trend in number of populations	Unknown but two subpopulations have been extirpated
Are there extreme fluctuations in number of populations?	Unknown but unlikely
List populations with number of mature individuals in each: Mt. Kruger: West slope – 6 North slope – unknown East slope – 500 to 700	
Threats (actual or imminent threats to populations or habitats)	
- actual and imminent: mineral exploration and mining activity, urban development	
Rescue Effect (immigration from an outside source)	
Status of outside population(s)? USA: Unknown or Not at Risk	
Is immigration known or possible?	Unknown but not likely due to the considerable distance to nearest US population in WA (175 km)
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Yes
Is rescue from outside populations likely?	Unlikely

Quantitative Analysis [provide details on calculation, source(s) of data, models, etc]	N/A
Current Status COSEWIC: Endangered (May 2005)	

Status and Reasons for Designation

Status: Endangered	Alpha-numeric code: B1ab (ii,iii,iv,v) + 2ab (ii, iii, iv, v)
Reasons for Designation: A geographically highly restricted perennial known only from three small populations numbering fewer than 1000 plants subject to continued habitat loss and population decline from urban expansion and mining activities.	
Applicability of Criteria Criterion A (Declining Total Population): Not applicable. Criterion B (Small Distribution, and Decline or Fluctuation): Meets Endangered B1ab (ii,iii,iv,v) + 2ab (ii,iii,iv,v) based on the small extent of occurrence and area of occupancy that are below threshold values, presence of only three populations and recent losses of two subpopulations resulting in declines in area of occupancy and number of mature individuals. Extent and quality of habitat has also declined as a result of urban expansion and mining activities. Criterion C (Small Total Population Size and Decline): Uncertain of applicability but may meet Endangered C2a(ii) based on a total population <<2500 plants and possibly 95% of all mature plants in one population on the east slope of Mt. Kruger. Unfortunately no counts are available for the north slope population. Criterion D (Very Small Population or Restricted Distribution): The species qualifies as threatened D2 based on the occurrence of only three populations at continued risk from habitat loss as result of urban expansion and mining activities. Criterion E (Quantitative Analysis): Not applicable.	

ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED

We thank Jared Hobbs for sharing his knowledge of property ownership on the east slope of Mount Kruger and details of the proposed Wildlife Habitat Area on the east slope of Mount Kruger. Jeff Hoyt kindly provided a map of the proposed Wildlife Habitat Area. Jenifer Penny reviewed the final draft and made valuable comments.

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- Hoyt, Jeff. Data Coordinator - Ungulate Winter Range / Identified Wildlife Management Strategy, Biodiversity Branch, Ministry of Water, Land and Air Protection. Victoria, British Columbia V8W 9M1.

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BIOGRAPHICAL SUMMARY OF REPORT WRITERS

Dr. George Wayne Douglas (1938-2005), well-known and respected British Columbia botanist, whose contribution to COSEWIC has included over 30 status reports, died in Duncan, BC, on 10 February 2005, after a short battle with cancer.

George W. Douglas had an M.Sci. (Forestry) from the University of Washington and a Ph.D. (Botany) from the University of Alberta, Edmonton. George worked with rare plants for over 20 years. He was senior author of *The Rare Plants of the Yukon* (1981), *The Rare Plants of British Columbia* (1985) and *Rare Native Plants of British Columbia* (1998, 2002). He was also the senior editor for the *Illustrated Flora of British Columbia* (1998-2002) and was the program botanist for the British Columbia Conservation Data Centre from 1991 until 2003. George wrote or co-wrote 30 COSEWIC status reports and three update status reports during this period.

Shyanne J. Smith has a B.Sc. (Geography) from the University of Victoria. She has conducted botanical inventory, research, and mapping projects in British Columbia since 2001. Shyanne was a co-author of the National Recovery Plan for Southern Maidenhair Fern (2004), two COSEWIC status reports, and three stewardship accounts for rare plants.

COLLECTIONS EXAMINED

Herbarium specimens housed at the Royal British Columbia Museum in Victoria (V) and the University of British Columbia (UBC) were examined.

